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EXAMINER	
YANG, ANDREW GUS	

ART UNIT	PAPER NUMBER
2628	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/584,063	WAKAYAMA, YORIHIKO	
	Examiner	Art Unit	
	ANDREW YANG	2628	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 June 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,4,5,7-10 and 12-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,4,5,7-10 and 12-15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 June 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 4-5, 7-8, and 12-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dowdell (U.S. Patent No. 5,301,263) in view of Joy et al. (U.S. Patent No. 5,043,923).

With respect to claim 1, Dowdell discloses a three-dimensional shape drawing device (column 7, lines 47-58, system in Fig. 3) for drawing a three-dimensional shape using a Z-buffer algorithm, the three-dimensional shape drawing device comprising:
a depth value calculation section for calculating a depth value of a pixel to be drawn (column 3, lines 52-54, computer calculates new z-value);
a high order Z-buffer memory for retaining high order bits of a depth value of a pixel to be displayed as a front face, the depth value of the pixel to be displayed as the front face being from among depth values calculated by the depth value calculation section (column 4, lines 45-50, most significant bytes from z-buffer memory);
a low order Z-buffer memory for retaining low order bits of the depth value of the pixel to be displayed as the front face (column 4, lines 45-50, middle significant and least significant bytes from z-buffer memory), a number of the low order bits retained in the low order Z-buffer memory being equal to or larger than a number of the high order bits

retained in the high order Z-buffer memory (column 4, lines 45-50, middle significant bytes and least significant bytes comprise low order bits, which are equal to or greater than the number of high order bits from the most significant byte);

a high order bit comparing section for reading the high order bits retained by the high order Z-buffer memory and comparing the read high order bits with high order bits of the depth value calculated by the depth value calculation section (column 4, lines 61-68, column 5, lines 1-14, comparator 114 in Fig. 1 compares old and new z-values);

a low order bit comparing section for, when a result of the comparing performed by the high order bit comparing section indicates that the high order bits of the depth value calculated by the depth value calculation section have a same value as the high order bits of the depth value of the pixel to be displayed as the front face retained by the high order Z-buffer memory, (i) reading the low order bits of the depth value of the pixel to be displayed as the front face and retained by the low order Z-buffer memory and (ii) comparing the read low order bits with low order bits of the depth value calculated by the depth value calculation section (column 5, lines 15-41, comparing lower order bits if high order bits are equal);

a record update section for, when the result of the comparing performed by the high order bit comparing section indicates that a depth indicated by the high order bits of the depth value calculated by the depth value calculation section is shallower than a depth indicated by the high order bits of the depth value of the pixel to be displayed as the front face and retained by the high order Z-buffer memory, (i) updating the high order bits of the depth value of the pixel to be displayed as the front face and retained by the

high order Z-buffer memory and (ii) the low order bits of the depth value of the pixel to be displayed as the front face and retained by the low order Z-buffer memory, by using the depth value calculated by the depth value calculation section (column 5, lines 5-10, updating the entire 24 bit new z-value), and for, when a result of a comparison performed by the low order bit comparing section indicates that a depth indicated by the low order bits of the depth value calculated by the depth value calculation section is shallower than a depth indicated by the low order bits of the depth value of the pixel to be displayed as the front face and retained by the low order Z-buffer memory, updating the low order bits of the depth value of the pixel to be displayed as the front face and retained by the low order Z-buffer memory by using the depth value calculated by the depth value calculation section (column 5, lines 19-23, column 5, lines 33-36);

a pixel value calculation section for calculating a pixel value, which is information about the pixel to be drawn (column 8, lines 59-68, color update unit 314);

an image memory for retaining the pixel value calculated by the pixel value calculation section (column 9, lines 1-3, frame buffer 315), and

wherein the pixel value calculation section calculates the pixel value when the result of the comparing performed by the high order bit comparing section indicates that the depth indicated by the high order bits of the depth value calculated by the depth value calculation section is shallower than the depth indicated by the high order bits of the depth value of the pixel to be displayed as the front face and retained by the high order Z-buffer memory and when the result of the comparing performed by the low order bit comparing section indicates that the low order bits of the depth value calculated by the

depth value calculation section have a same value as the low order bits of the depth value of the pixel to be displayed as the front face and retained by the low order Z-buffer memory (column 8, lines 12-21, as a result of whether or not the new z-value has replaced the old z-value, lines 59-62). However, Dowdell does not expressly disclose a high order Z-buffer clearing section for initializing the depth value of the pixel to be displayed as the front face and retained by the high order Z-buffer memory with a predetermined value, wherein the predetermined value indicates one of a shallowest depth value and a deepest depth value.

Joy et al. who also deal with rendering computer graphics, disclose a method for initializing the depth value of the pixel to be displayed as the front face and retained by the high order Z-buffer memory with a predetermined value, wherein the predetermined value indicates one of a shallowest depth value and a deepest depth value (column 8, lines 9-20, Z buffer memory is first cleared, or initialized to the background Z value, background is the deepest indication which may be displayed, thus is the deepest depth value).

Dowdell and Joy et al. are in the same field of endeavor, namely computer graphics.

At the time of the invention, it would have been obvious to combine the method of using graphics hardware (high order Z-buffer clearing section) for initializing the depth value of the pixel to be displayed as the front face and retained by the high order Z-buffer memory with a predetermined value, wherein the predetermined value indicates one of a shallowest depth value and a deepest depth value, as taught by Joy et al. with

the Dowdell reference, because this would determine which pixels have been utilized and which are to be disregarded (column 8, lines 16-20 of Joy et al.).

With respect to claim 4, Dowdell discloses the three-dimensional shape drawing device according to claim 1, wherein the low order bit comparing section updates the low order bits of the depth value of the pixel to be displayed as the front face and retained by the low order Z-buffer memory when the low order bits calculated by the depth value calculation section have a same value as the low order bits of the depth value of the pixel to be displayed as the front face and retained by the low order Z-buffer memory (column 5, lines 38-41, in the case where the old 24 bit z-value is equal to the new 24 bit z-value, the new value is equal to the old value and already written to memory, thus the low order bits have been updated).

With respect to claim 5, Dowdell discloses the three-dimensional shape drawing device according to claim 1, wherein, when the result of the comparing performed by the low order bit comparing section indicates that the low order bits calculated by the depth value calculation section have a same value as the low order bits of the depth value of the pixel to be displayed as the front face and retained by the low order Z-buffer memory, the high order bit comparing section performs, for a next pixel, a comparison of high order bits of depth values (column 3, lines 38-42, updating operation is performed for a given pixel, and continues to the next pixel for until all pixels have been processed).

With respect to claim 7, Dowdell discloses the three-dimensional shape drawing device according to claim 1. However, Dowdell does not expressly disclose a low order

Z-buffer clearing section for initializing the depth value of the pixel to be displayed as the front face and retained by the low order Z-buffer memory.

Joy et al. who also deal with rendering computer graphics, disclose a method for initializing the depth value of the pixel to be displayed as the front face and retained by the low order Z-buffer memory (column 8, lines 9-20, Z buffer memory is first cleared, or initialized to the background Z value, Z buffer memory for each frame stores the front most value for each pixel, or pixel to be displayed as the front face).

Dowdell and Joy et al. are in the same field of endeavor, namely computer graphics.

At the time of the invention, it would have been obvious to combine the method of using graphics hardware (low order Z-buffer clearing section) for initializing the depth value of the pixel to be displayed as the front face and retained by the low order Z-buffer memory, as taught by Joy et al. with the Dowdell reference, because this would determine which pixels have been utilized and which are to be disregarded (column 8, lines 16-20 of Joy et al.).

With respect to claim 8, Dowdell discloses the three-dimensional shape drawing device according to claim 1, wherein, when the depth indicated by the high order bits of the depth value calculated by the depth value calculation section is determined to be shallower than the depth indicated by the high order bits of the depth value of the pixel to be displayed as the front face and retained by the high order Z-buffer memory, the high order bit comparing section adds a flag to the high order bits of the depth value calculated by the depth value calculation section,

wherein, when the depth indicated by the low order bits of the depth value calculated by the depth value calculation section is determined to be shallower than the depth indicated by the low order bits of the depth value of the pixel to be displayed as the front face and retained by the low order Z-buffer memory, the low order bit comparing section adds a flag to the low order bits of the depth value calculated by the depth value calculation section, and

wherein, when the flag is added to the high order bits of the depth value calculated by the depth value calculation section, the record update section updates the high order bits of the depth value of the pixel to be displayed as the front face and retained by the high order Z-buffer memory and the low order bits of the depth value of the pixel to be displayed as the front face and retained by the low order Z-buffer memory, and when the flag is added to the low order bits of the depth value calculated by the depth value calculation section, the record update section updates either (i) only the low order bits of the depth value of the pixel to be displayed as the front face and retained by the low order Z-buffer memory, or (ii) both the high order bits of the depth value of the pixel to be displayed as the front face and retained by the high order Z-buffer memory and the low order bits of the depth value of the pixel to be displayed as the front face and retained by the low order Z-buffer memory (column 4, lines 61-68, column 5, lines 1-41). It is noted that Dowdell does not explicitly disclose the use of a “flag” for signifying when to update the high order and low order bits; however, a flag is merely a variable associated with the result of the comparison of the high and low order bits. Therefore,

Dowdell discloses using at least a variable for determining whether further bits are retained as by the “done” state in Fig. 2.

With respect to claim 12, Dowdell discloses a three-dimensional shape drawing method for drawing a three-dimensional shape using Z-buffer algorithm, the three-dimensional shape drawing method comprising:

calculating a depth value of a pixel to be drawn (column 3, lines 52-55, calculated from computer);

reading high order bits from a high order Z-buffer memory retaining high order bits of a depth value of a pixel to be displayed as a front face, the depth value of the pixel to be displayed as the front face being from among depth values calculated by the calculating of the depth value (column 4, lines 45-50, most significant bits), and comparing the high order bits read by the reading with high order bits of the depth value calculated by the calculating of the depth value of the pixel to be drawn (column 4, lines 61-68, column 5, lines 1-14, comparing most significant byte);

when the high order bits of the depth value calculated by the calculating of the depth value are determined, by the comparing of the high order bits, to have a same value as the high order bits of the pixel to be displayed as the front face and retained by the high order Z-buffer memory, (i) reading low order bits from a low order Z-buffer memory retaining low order bits of the depth value of the pixel to be displayed as the front face, a number of the low order bits retained in the low order Z-buffer memory being equal to or larger than a number of the high order bits retained in the high order Z-buffer memory (column 4, lines 45-50, middle significant bytes and least significant bytes comprise low

order bits, which are equal to or greater than the number of high order bits from the most significant byte), and the depth value of the pixel to be displayed as the front face being from among the depth values calculated by the calculating of the depth value, and (ii) comparing the read low order bits with low order bits of the depth value calculated by the calculating of the depth value (column 5, lines 15-27); and updating the high order bits of the depth value of the pixel to be displayed as the front face and retained by the high order Z-buffer memory and the low order bits of the depth value of the pixel to be displayed as the front face and retained by the low order Z-buffer memory, using the depth value calculated by calculating of the depth value, when a depth indicated by the high order bits of the depth value calculated by the calculating of the depth value is determined, by the comparing of the high order bits, to be shallower than a depth indicated by the high order bits of the depth value of the pixel to be displayed as the front face and retained by the high order Z-buffer memory (column 5, lines 5-10), updating the low order bits of the depth value of the pixel to be displayed as the front face and retained by the low order Z-buffer memory using the depth value calculated by the calculating of the depth value when a depth indicated by the low order bits of the depth value calculated by the calculating of the depth value is determined, by the comparing of the low order bits, to be shallower than a depth indicated by the low order bits of the depth value of the pixel to be displayed as the front face and retained by the low order Z-buffer memory (column 5, lines 16-23);

calculating a pixel value, which is information about the pixel to be drawn (column 8, lines 59-68, color update unit 314);

retaining, in an image memory, the pixel value calculated by the calculating of the pixel value (column 9, lines 1-3, frame buffer 315), and

wherein the calculating of the pixel value calculates the pixel value when a result of the comparing of the high order bits indicates that the depth indicated by the high order bits of the depth value calculated by the calculating of the depth value is shallower than the depth indicated by the high order bits of the depth value of the pixel to be displayed as the front face and retained by the high order Z-buffer memory and when a result of the comparing of the low order bits indicates that the low order bits of the depth value calculated by the depth value calculation section have a same value as the low order bits of the depth value of the pixel to be displayed as the front face and retained by the low order Z-buffer memory (column 8, lines 12-21, as a result of whether or not the new z-value has replaced the old z-value, lines 59-62). However, Dowdell does not expressly disclose initializing the depth value of the pixel to be displayed as the front face and retained by the high order Z-buffer memory with a predetermined value, wherein the predetermined value indicates one of a shallowest depth value and a deepest depth value.

Joy et al. who also deal with rendering computer graphics, disclose a method for initializing the depth value of the pixel to be displayed as the front face and retained by the high order Z-buffer memory with a predetermined value, wherein the predetermined value indicates one of a shallowest depth value and a deepest depth value (column 8, lines 9-20, Z buffer memory is first cleared, or initialized to the background Z value,

background is the deepest indication which may be displayed, thus is the deepest depth value).

Dowdell and Joy et al. are in the same field of endeavor, namely computer graphics.

At the time of the invention, it would have been obvious to combine the method of initializing the depth value of the pixel to be displayed as the front face and retained by the high order Z-buffer memory with a predetermined value, wherein the predetermined value indicates one of a shallowest depth value and a deepest depth value, as taught by Joy et al. with the Dowdell reference, because this would determine which pixels have been utilized and which are to be disregarded (column 8, lines 16-20 of Joy et al.).

With respect to claim 13, Dowdell discloses the three-dimensional shape drawing method according to claim 12, wherein when, at the comparing of the low order bits, the low order bits calculated by the calculating of the depth value are determined to have a same value of the low order bits of the depth value of the pixel to be displayed as the front face and retained by the low order Z-buffer memory, the low order bits retained by the low order Z-buffer memory are updated (column 5, lines 38-41, in the case where the old 24 bit z-value is equal to the new 24 bit z-value, the new value is equal to the old value and already written to memory, thus the low order bits have been updated).

With respect to claim 14, Dowdell discloses the three-dimensional shape drawing method according to claim 12, wherein when, at the comparing of the low order bits, the low order bits calculated by the calculating of the depth value are determined to have a

same value of the low order bits of the depth value of the pixel to be displayed as the front face and retained by the low order Z-buffer memory, a comparison of high order bits of depth values is performed for a next pixel (column 3, lines 38-42, updating operation is performed for a given pixel, and continues to the next pixel for until all pixels have been processed).

With respect to claim 15, Dowdell discloses the three-dimensional shape drawing method according to claim 12. However, Dowdell does not expressly disclose initializing the depth value of the pixel to be displayed as the front face and retained by the low order Z-buffer memory.

Joy et al. who also deal with rendering computer graphics, disclose a method for initializing the depth value of the pixel to be displayed as the front face and retained by the low order Z-buffer memory (column 8, lines 9-20, Z buffer memory is first cleared, or initialized to the background Z value, Z buffer memory for each frame stores the front most value for each pixel, or pixel to be displayed as the front face).

Dowdell and Joy et al. are in the same field of endeavor, namely computer graphics.

At the time of the invention, it would have been obvious to combine the method of initializing the depth value of the pixel to be displayed as the front face and retained by the low order Z-buffer memory, as taught by Joy et al. with the Dowdell reference, because this would determine which pixels have been utilized and which are to be disregarded (column 8, lines 16-20 of Joy et al.).

Claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dowdell (U.S. Patent No. 5,301,263) in view of Joy et al. (U.S. Patent No. 5,043,923), and further in view of Narayanaswami (U.S. Patent No. 6,160,557).

With respect to claims 9-10, Dowdell discloses the device of claims 1 and 9, respectively, wherein the high order bits and the low order bits are respectively stored in the high order Z-buffer memory and the low order Z-buffer memory and has the same configuration as the high order Z-buffer memory (column 3, lines 44-46, register 104 and 108 in Fig. 1 each store high order and low order bits in the form of the z-value, and each individual register is a single memory having the same configuration). However, Dowdell does not expressly disclose the high order bits and the low order bits are respectively stored in the high order Z-buffer memory and the low order Z-buffer memory which is physically separated from the high order Z-buffer memory, the high order bits and the low order bits being separated as different bit strings.

At the time of the invention was made, it would have been an obvious matter of design choice to a person of ordinary skill in the art to modify Dowdell to use memory that is physically separable because Applicant has not disclosed that using physically separable memory provides an advantage, is used for a particular purpose, or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected Applicant’s invention to perform equally well with using one memory (Applicant's specification, page 25, paragraph 58) because the high order bits and low order bits are separately recorded at different addresses in one memory.

Therefore, it would have been an obvious matter of design choice to modify

Dowdell to obtain the invention as specified in claims 9-10.

Narayanaswami, who also deals with using a z-buffer, discloses a method for using a bit string (column 10, lines 3-14).

Dowdell and Narayanaswami are in the same field of endeavor, namely computer graphics.

At the time of the invention, it would have been obvious to one skilled in the art to combine the method of using a bit string for storing data as taught by Narayanaswami with the Dowdell reference, because this would facilitate comparing bits of data.

Response to Arguments

Applicant's arguments with respect to claim 1 have been considered but are moot in view of the new ground(s) of rejection. The rejection is now based on Dowdell (U.S. Patent No. 5,301,263) in view of Joy et al. (U.S. Patent No. 5,043,923).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. Patent No. 6,411,290 to Sasaki for a method of initializing the z buffer

U.S. PGPUB 20010028354 to Cheng et al. for a method of clearing the z-buffer

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANDREW YANG whose telephone number is (571)272-5514. The examiner can normally be reached on 8:30-5 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ulka Chauhan can be reached on (571)272-7782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AGY

8/26/10

/Ulka Chauhan/
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